

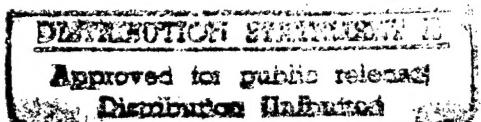
Basewide Energy Systems Plan

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Executive Summary

Final Report

Fort Campbell, Kentucky



March 1980

Prepared For
MOBILE DISTRICT CORPS OF ENGINEERS
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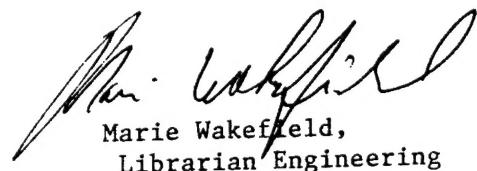


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EXECUTIVE SUMMARY

Included in this summary are the results of the Basewide Energy Systems Plan for Fort Campbell, Kentucky. This plan includes an analysis and recommendation of energy conservation projects for the reduction of the installation's present energy consumption. The installation should be aware that the savings figures presented in this summary can only be realized after all projects have been implemented. Black & Veatch has developed projects that would meet funding requirements for the energy conservation program. Furthermore, the recommended projects provide partial compliance with the energy conservation requirement for the installation as outlined in the Army Facilities Energy Plan. This summary presents data on the following:

- Existing energy consumption
- Source energy reductions due to energy conservation techniques applied to building systems
- Application of solar energy to reduce fossil fuel consumption
- Savings utilizing central energy monitoring and control systems (EMCS)
- Use of solid waste as an alternate energy source
- The analysis of Total Energy/Selective Energy (TE/SE) systems

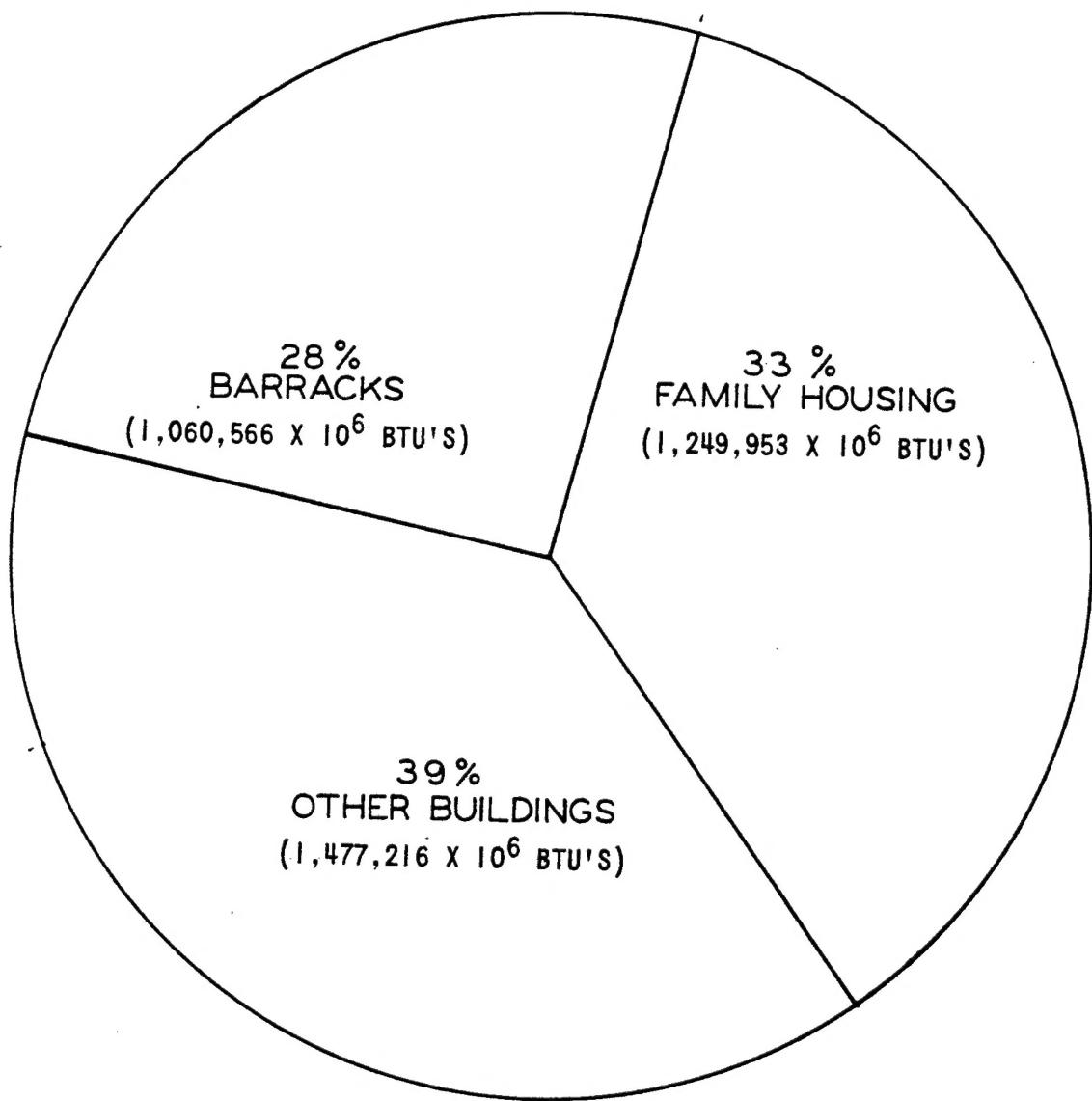
Tables 1 and 2 present information pertaining to the physical descriptions and energy consumption of 43 typical buildings used to

verify historical energy consumption in the development of the basewide energy use model. This model was then utilized as the foundation for energy conservation project analyses and recommendations. Table 3 summarizes the daily personnel occupancy for each typical building. Tables 1, 2 and 3 also provide information which may be used to estimate source energy consumption for similar buildings within the designated groupings (see Appendix A for all tables referenced in this report). The estimated annual source energy consumption for all building types contributing to the basewide annual total of 3,787,735 mega-Btu, consumed during base year 1978, is shown on Figure 1.

Table 4 indicates the annual source energy consumed by each of the significant building groups used in our basewide energy model. Since Fort Campbell has experienced major expansion in its housing of families and troops, our model was compared to fiscal year 1978. This housing expansion has been incorporated into the building list. The building list was then used to develop a basewide model within 10 percent of the FY 78 historical source energy consumption shown below.

Yearly Source Energy⁶
Consumption in Btu x 10⁶

Electricity	2,106,125
Natural Gas	1,311,034
Propane Gas	9,880
Fuel Oil No. 2	72,468
Fuel Oil No. 5	<u>288,228</u>
 TOTAL	 3,787,735



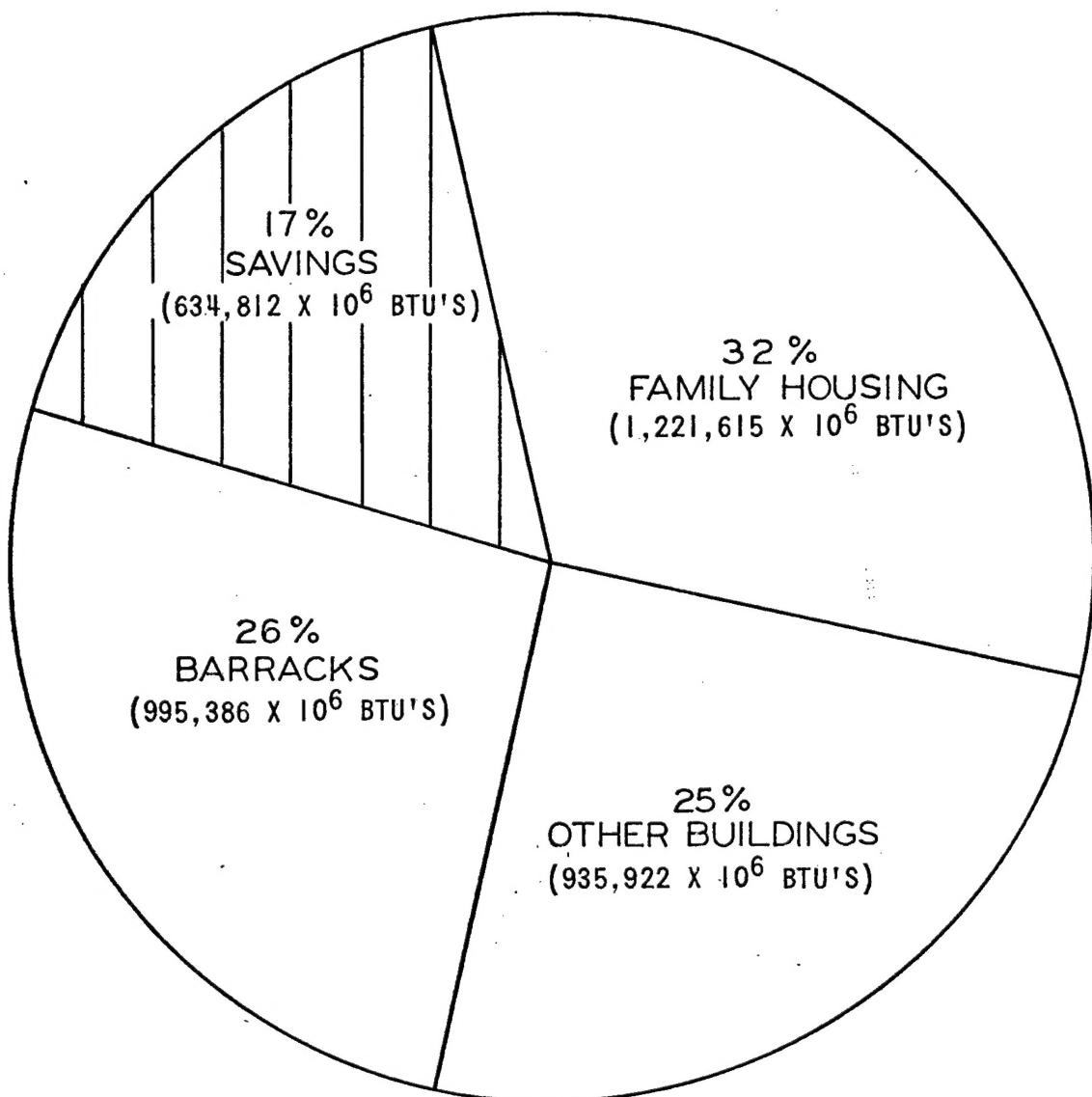
BASEWIDE CONSUMPTION FY '78
 $(3,787,735 \times 10^6 \text{ BTU'S})$

FIGURE 1

The total estimated source energy savings due to implementation of all feasible energy conservation projects developed within the scope of this study is 634,812 mega-Btu/year. These projects consisted of various mechanical and electrical system modifications. Refer to Appendix B of this summary for lists of all projects investigated. The lists also provide comments that explain briefly Black & Veatch's action or recommendation. It should be noted that the installation has undertaken implementation of projects recommended by others. Further description of these projects is listed in the report, Total Energy, Selective Energy, and Central Boiler Plants.

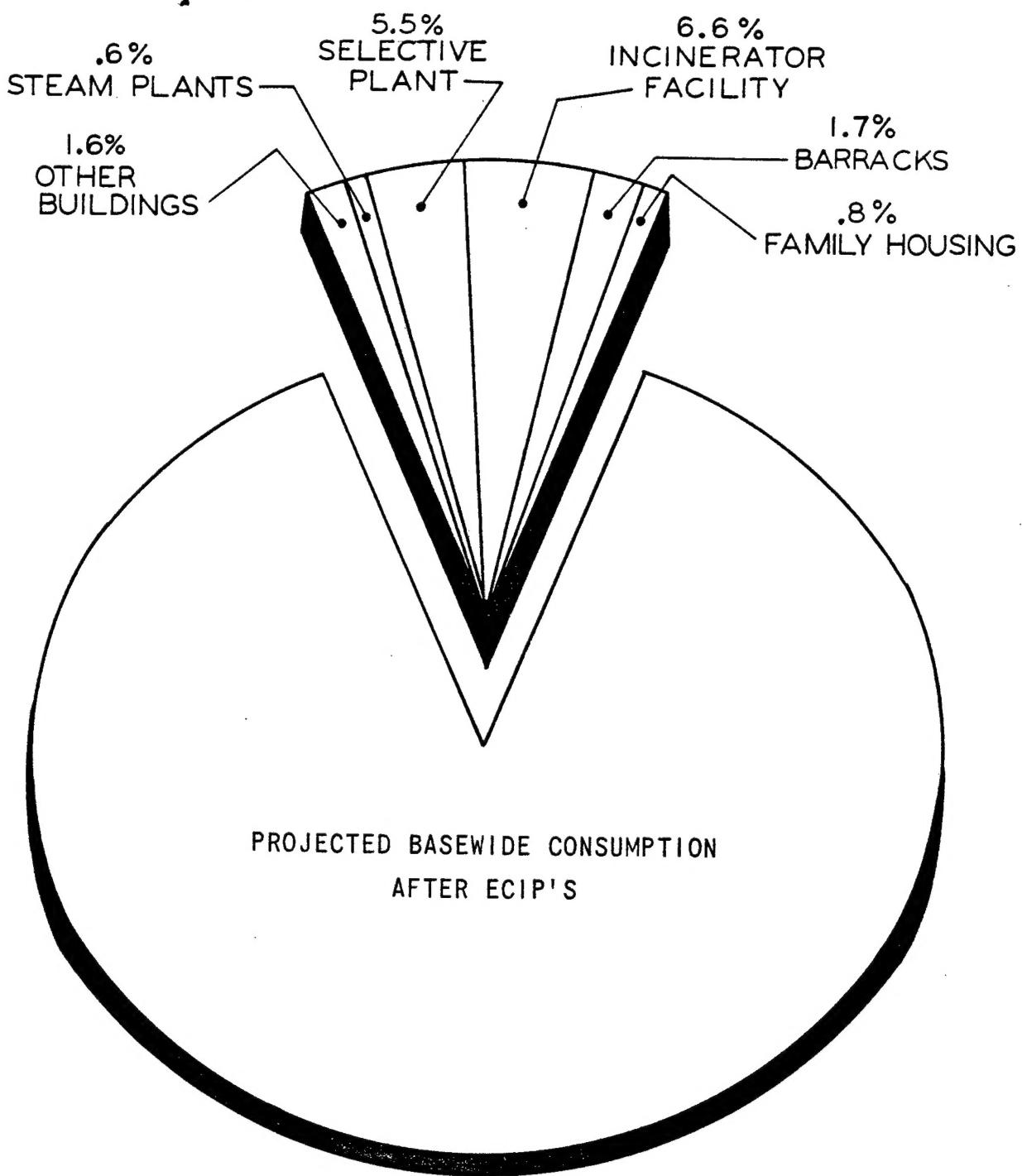
Table 5 lists the project number, percent of basewide reduction, and the source energy savings for the indicated building types. Figure 2 illustrates the combined effect of the recommended energy saving improvements, as compared to FY 78 source energy expenditure. Our estimates indicate a savings of approximately 17 percent over the base year (1978). For the source energy consumption of FY's 75 through 77, refer to the Energy Use Survey. Figure 3 illustrates the relative percent reduction for significant building groups comprising the 634,812 mega-Btu/year.

A detailed analysis of the projects listed in Table 5 is included in the following reports. Further explanation of the historical energy consumption, basewide energy model, and energy conservation analysis, can be found in the Energy Use Survey. The reduction of Fort Campbell's dependence on nonrenewable energy sources by utilizing solar energy, a



BASEWIDE CONSUMPTION
AFTER
ENERGY CONSERVATION PROJECTS!
 $(3,152,923 \times 10^6 \text{ BTU'S})$

FIGURE 2



ALLOCATION OF
ENERGY CONSERVATION PROJECT'S
SAVINGS
FOR SIGNIFICANT BUILDING GROUPS

FIGURE 3

renewable energy source, indicates a total savings of 17,176 mega-Btu/year. Nine concepts were evaluated, resulting in the recommendation of Project Nos. 418 and 421 which are presented in the Solar Energy Applications and Evaluations. The report on Energy Monitoring and Control Systems (EMCS), recommends the installation of a minicomputer-based EMCS center. This system would enable the installation to reduce its energy consumption by utilizing various computer initiated energy reducing applications programs. With the addition of an FM radio system under the control of the minicomputer, the entire EMCS project would save 132,718 mega-Btu/year. Additional information is provided in the EMCS report. The investigation of solid waste for reducing source energy consumption at Fort Campbell resulted in the development of Project No. 416. This project recommends the installation of two solid waste-burning incinerator facilities to provide steam to the existing steam distribution systems. The proposed plants would enable the installation to supplement the Central Energy Facility No. 3902 and Heating Plant No. 7008, thereby reducing fuel oil and electric consumption totalling 248,028 mega-Btu/year. The details and descriptions of the systems analyzed can be found in the report, Total Energy, Selective Energy, and Central Boiler Plants.

The installation of a coal-burning Selective Energy plant has been recommended for Fort Campbell. This plant would supply steam to an expanded steam distribution system while generating 36 percent of the installation's total electric power requirements. A basewide source

energy savings of 5 percent could be realized with a reduction of 45 percent in natural gas and fuel oil consumption. Detailed descriptions of the TE/SE systems analyzed are included in the Total Energy, Selective Energy, and Central Boiler Plants report.

Table 6 was developed to give a prioritized schedule, in order of fiscal year, for implementing the recommended energy conservation projects. Figure 4 was ultimately devised to illustrate Fort Campbell's projected source energy use through 1987. The figure includes both the effect of the source energy reduction due to the implementation of the recommended projects by fiscal year and the energy increase based on projected population figures found in the Energy Use Survey. Figure 5 indicates the impact of increasing energy costs and the reduction of those costs after the implementation of projects listed in Table 6. The energy costs were escalated using the rates supplied by the Office of the Chief of Engineers in the volume entitled Energy Conservation Investment Program Guidance.

PROJECTED ENERGY CONSUMPTION - FORT CAMPBELL, KENTUCKY

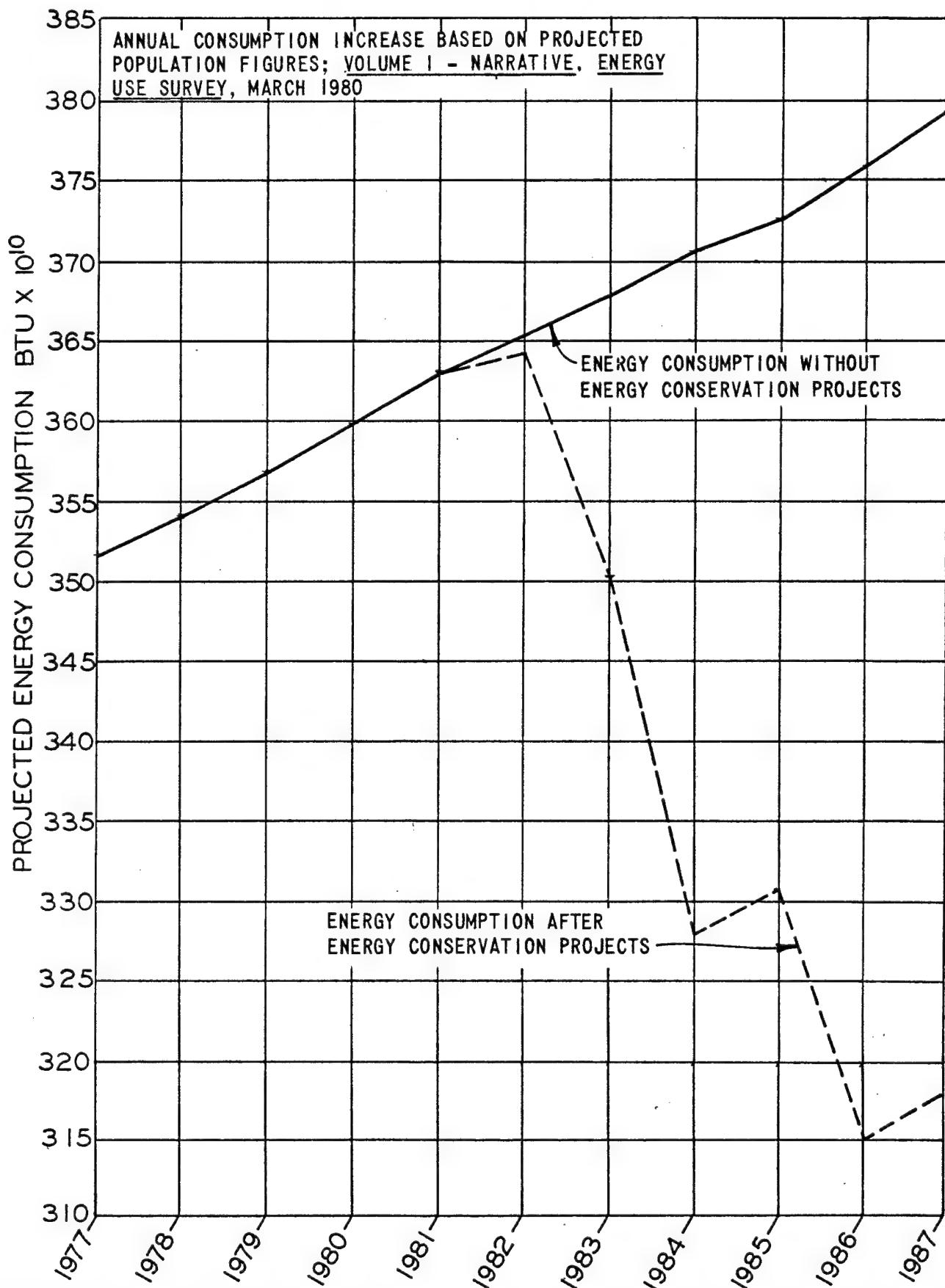


FIGURE 4

PROJECTED ENERGY COST - FORT CAMPBELL, KENTUCKY

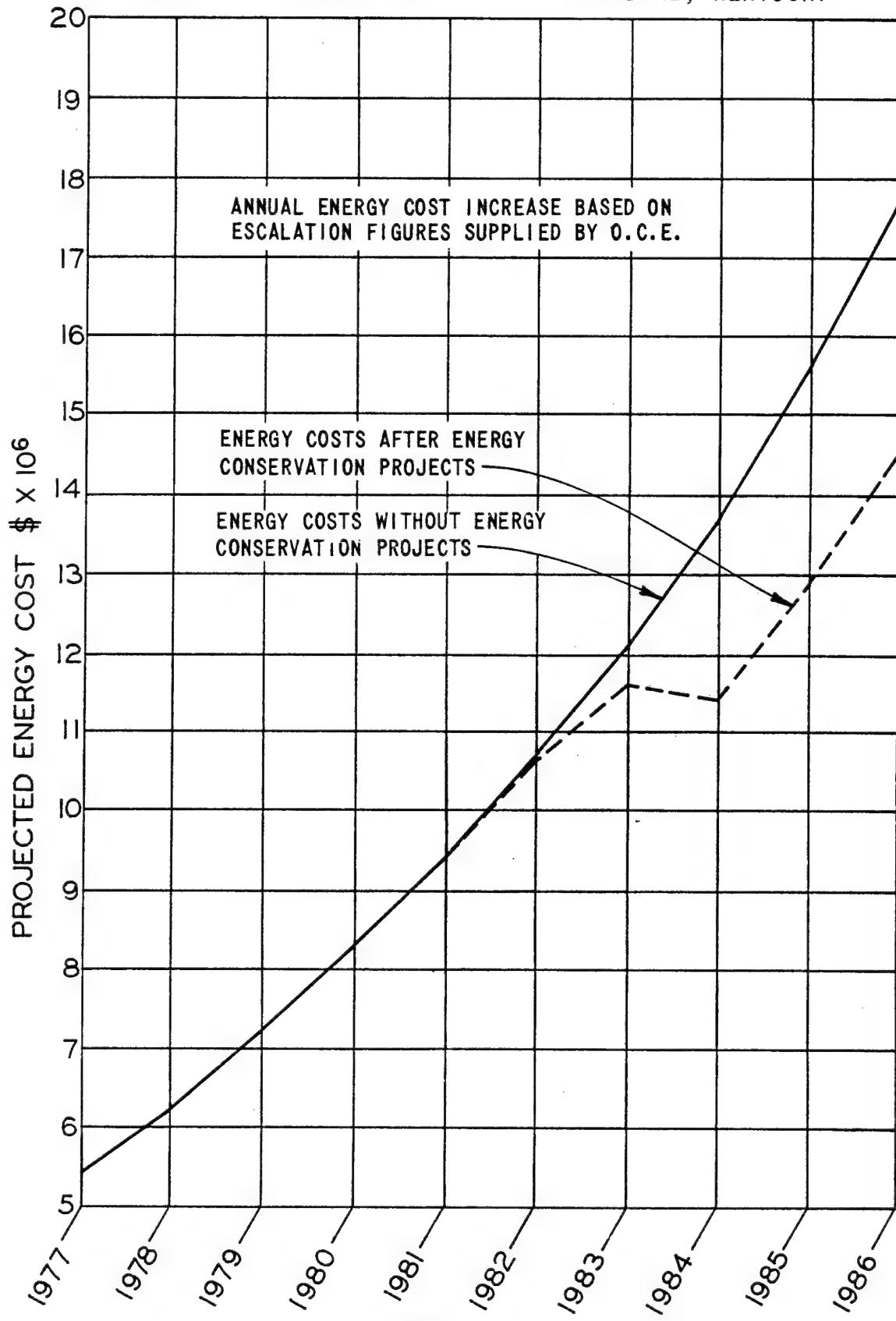


FIGURE 5

APPENDIX A

TABLES

TABLE I
TYPICAL BUILDING CONSTRUCTION DATA
FORT CAMPBELL

GROUP NO.	BLDG. NO.	BUILDING DESCRIPTION	NO. FILE	CONSTRUCTION				"U" VALUES				DOMESTIC WATER HEATING	PEAK TRS LOAD HHR	CAP. (TONS)	FUEL GAIN	CAP. (G)					
				ROOF	WALL	FLOOR	WINDOW	DOOR	ROOF	WALL	FLOOR										
A-1	6914	OFFICE	1	BUILT-UP	CHU	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL	.07	.36	—	1.13	.55	1142	2660	WINDW	3				
A-2	5115	MOTOR REPAIR	1	BUILT-UP	ASBESTOS WOOD FRAME	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD	.85	.31	—	1.13	.47	1.06	59	HOT H2O	59	ELEC.			
A-3	7258	OFFICE	2	BUILT-UP	CHU	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL	.06	.87	—	1.13	.49	1.06	59	UNIT HTR.	3	15.0186.8			
B-1	6709	BARRACKS WITH HESS	2	BUILT-UP	CHU	TILE, CLOSED CRAN. SPACE	SINGLE CLEAR GLASS	WOOD	.06	.13	.56	1.13	.49	5843	39722	SPLIT SYSTEM	20	NOT H2O BOILER	58.0168.2	20 ELEC.	
B-2	7120	BARRACKS	3	BUILT-UP	CONC. BLOCK	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL	.14	.97	—	1.13	.49	177	5072	WINDW	3	NOT H2O BOILER	59	15.0186.8	
B-3	1582	BACHELOR OFFICER'S QTRS.	2	ASPHALT WOOD SIDING & STUCCO	SHINGLES	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD	.05	.06	.47	1.13	.49	599	6566	SPLIT SYSTEM	20	NOT H2O BOILER	58.0168.2	20 ELEC.	
B-4	2170	BARRACKS	2	COMPOSITE SHINGLES	SHINGLES	TILE, OPEN CRAN. SPACE	SINGLE CLEAR GLASS	WOOD	.32	.52	.46	1.13	.49	404	5310	ABSORP. CHILLER	80	B.P. 6711	STEAM 156.0681.6	950 STEAM	
C-1	6590	GYMNASIUM	1	BUILT-UP	CHU	SLAB ON GRADE	SINGLE CLEAR GLASS	GLASS, METAL	.07	.51	—	1.13	.49	2112	25200	PIG.	46	B.P. 7106	STEAM 153.0477.1	575 STEAM	
C-2	3109	THEATER	1	COMPOSITE SHINGLES	SHINGLES	TILE, OPEN CRAN. SPACE	SINGLE CLEAR GLASS	METAL	.32	.32	.46	1.13	.49	1008	8780	SPLIT SYSTEM	17	FURNACE GAS/	31.2113.7	100 GAS/ OIL	
C-3	2607	CHAPEL	1	ASPHALT WOOD FRAME	SHINGLES	T & G, CLOSED CRAN. SPACE	SINGLE CLEAR GLASS	WOOD	.34	.26	.49	1.13	.49	404	5310	None	—	FURNACE GAS	—	206.5 100 GAS	
C-4	5702	PRATT MUSEUM	2	BUILT-UP	METAL SIDING	SLAB ON GRADE	NONE	METAL	.07	.06	—	1.13	.49	1896	23229	PIG. & SYSTEM	26	BOILER GAS	90.5608.7	250 GAS	
C-5	6722	POST EXCHANGE	1	BUILT-UP	CONC. BLOCK	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL	.18	.53	—	1.13	.49	431	4563	SPLIT SYSTEM	13	FURNACE GAS	104.7294.9	— NONE	
C-6	2575	FIRE STATION	1	BUILT-UP	CHU	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL	.13	.31	—	1.13	.49	503	5765	None	—	UNIT HTR. RADIATOR	—	126.5 10 GAS	
D-1	2440	MCO MESS	1	COMPOSITE SHINGLES	SHINGLES	TILE, CLOSED CRAN. SPACE	SINGLE CLEAR GLASS	WOOD	.05	.32	.38	1.13	.49	11000	11000	WATER COOLED	90	NOT H2O BOILER	35.5121.0	80 ELEC.	
E-1	2442	CLASSROOM	1	COMPOSITE SHINGLES	SHINGLES	TILE, CLOSED CRAN. SPACE	SINGLE CLEAR GLASS	WOOD	.05	.32	.38	1.13	.49	1.06	5867	WATER COOLED	15	BOILER GAS	35.7160.5	140 STEAM	
E-2	2912	CLASSROOM	1	METAL	METAL	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL	.15	.27	—	1.13	.49	219	7557	WIN. U. PIG.	9	BOILER GAS	30.163.5	80 ELEC.	
F-1	4348	DUPLEX FAMILY HOUSING	2	ASPHALT SHINGLES	SHINGLES	BRICK & ALUMINUM	SINGLE CLEAR GLASS	WOOD	.06	.08	—	1.13	.49	370	2200	None	—	UNIT HTR.	—	66.1 100 GAS	
F-2	402	DUPLEX FAMILY HOUSING	1	ASPHALT SHINGLES	SHINGLES	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD	.06	.17	—	1.13	.49	370	2200	None	—	UNIT HTR.	—	75.5 100 GAS	
F-3	4848	MULTI-FAMILY HOUSING	2	ASPHALT SHINGLES	SHINGLES	T & G, CLOSED CRAN. SPACE	SINGLE CLEAR GLASS	WOOD	.06	.19	—	1.13	.49	226	2684	PIG.	283	FURNACE GAS	21.956.1	40 GAS	
F-4	3027	MULTI-FAMILY HOUSING	1	ASPHALT SHINGLES	SHINGLES	ONE, CLOSED CRAN. SPACE	SINGLE CLEAR GLASS	WOOD	.06	.22	—	1.13	.49	1828	11904	WINDW	1	UNIT HTR.	—	95.3 50 GAS	
F-5	7370	MULTI-FAMILY HOUSING	2	BUILT-UP	WOOD SIDING	SLAB ON GRADE	SINGLE CLEAR GLASS	WOOD	.06	.22	.20	1.13	.49	1.06	1867	10196	None	—	FURNACE GAS	—	22.2220.7 NO ELEC.
G-1	860	LAUNDRY	1	ASPHALT SHINGLES	SHINGLES	CLAPBOARD WOOD FRAME	SINGLE CLEAR GLASS	WOOD	.33	.26	—	1.13	.49	1.06	47	55550	WINDW	1.5	H2O None	—	9.59 — N/A —
H-1	125	HOSPITAL	2	ASPHALT SHINGLES	SHINGLES	T & G, CRAN. SPACE	SINGLE CLEAR GLASS	WOOD	.33	.26	.30	1.13	.49	1.06	47	48564	AIR COOLED CHILLER	30	B.P. 7294	STEAM 147.0468.5	100 ELEC.
H-2	127	HOSPITAL	2	ASPHALT SHINGLES	SHINGLES	T & G, CRAN. SPACE	SINGLE CLEAR GLASS	WOOD	.33	.26	.30	1.13	.49	1.06	47	3246	16768 A. MIN.	26	B.P. 157	STEAM 157.4528.4	200 GAS
H-3	7297	HELICOPTER HANGER	2	BUILT-UP	CMO, METAL	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL	.48	.51	—	1.13	.49	1.06	47	3246	16768 A. MIN.	26	BOILER COAL	—	157.5 NO ELEC.
H-4	749	MOTOR REPAIR	1	MINERAL SURFACE	MINERAL SURFACE	CLAPBOARD WOOD FRAME	SINGLE CLEAR GLASS	METAL	.32	.36	—	1.13	.49	416	3108	None	—	BOILER COAL	—	192.0 40 GAS	
H-5	6256	MOTOR REPAIR SHOP	1	BUILT-UP	CONCRETE	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL	.13	.67	—	1.13	.49	4960	None	—	—	B.P. 6256	STEAM 147.0468.5	100 ELEC.	
H-6	5982	REPAIR & MAINTENANCE	1	MINERAL SURFACE	MINERAL SURFACE	CLAPBOARD T & G SIDING	SINGLE CLEAR GLASS	WOOD	.32	.36	—	1.13	.49	416	2312	None	—	BOILER COAL	—	35.9 40 GAS	

TABLE I (CONT'D)
TYPICAL BUILDING CONSTRUCTION DATA
FORT CAMPBELL

GROUP NO.	BLDG NO.	BUILDING DESCRIPTION	CONSTRUCTION				"U" VALUES			WINDOW AREA (FT. 2)	COOLING SYSTEM	HEATING SYSTEM	DOMESTIC HOT WATER CAP. (G)	PEAK TWS LOAD MBH	
			NO. FLS.	ROOF	WALL	FLOOR	WINDOW	DOOR	ROOF						
T-1	7651	RECEIVER	1	BUILT-UP - CONCRETE BLOCK	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL	.12	.15	—	1.13	.55	125	1089	None
T-2	7238	COMMUNICATION	1	BUILT-UP CMU	SLAB ON GRADE	SINGLE CLEAR GLASS	METAL	.12	.15	—	1.13	.55	139	1392	SPLIT SYSTEM
M-1	806	WAREHOUSE	1	ASPHALT SHINGLES	CLAPBOARD, WOOD, CLOSED WOOD FRAME	SINGLE CLEAR GLASS	METAL	.08	.36	.38	1.13	.55	70	9000	None
M-2	838	WAREHOUSE	1	ASPHALT SHINGLES	CLAPBOARD, CONCRETE, T & G SIDING	SINGLE CLEAR GLASS	METAL	.52	.36	.52	1.13	.56	240	1350	None
M-3	160	MEDICAL WAREHOUSE	1	ASPHALT SHINGLES	BRICK T & G, CLOSED WOOD FRAME	SINGLE CLEAR GLASS	WOOD	.52	.20	.50	1.13	.49	1026	26673	WINDOW UNITS
L-2	2842	PRESSING PLANT	1	STEEL CONCRETE	CONCRETE	SINGLE CLEAR GLASS	METAL	(NO WTG. OR CLG., NO "U" VALUES NECESSARY)					35520	None	None
U-1	7635	SEWAGE TREATMENT	—	—	—	NOT APPLICABLE	—						1260	None	UNIT HTR.
U-2	1746	WATER TREATMENT	—	—	—	NOT APPLICABLE	—						10276	None	None
U-3	7291	PUMPHOUSE	—	—	—	NOT APPLICABLE	—						1007	None	None
U-4	7008	BOILER PLANT	—	—	—	NOT APPLICABLE	—						2828	WINDOW	2 UNIT HTR.
U-5	1137	MACHINE SHOP	—	—	—	NOT APPLICABLE	—						120	None	None
Z	—	ELECT. USE ONLY	(INCLUDES OUTDOOR LIGHTS AND ELECTRIC AUXILIARIES)				NOT APPLICABLE	—						None	None
V	—	REAL ESTATE	—	—	—	NOT APPLICABLE	—							None	None
X	—	BUILDINGS USING UTILITIES	—	—	—	NOT APPLICABLE	—							None	None

TABLE 2
TYPICAL BUILDING ENERGY CONSUMPTION DATA
FORT CAMPBELL

GROUP NO.	BLDG.	BUILDING DESCRIPTION	ANNUAL ENER. SOURCE CONSUMPTION BTU x 10 ³			ELEC'L ENER. CONSUMPTION		BTU x 10 ³ FT ²
			FUEL	ELEC.	TOTAL	KW PEAK	KWH/YR	
A-1	6914	OFFICE	868	415	1283	36	35750	350.5
A-2	5115	MOTOR REPAIR OFFICE	630	265	895	16	22860	291.3
A-3	7258	OFFICE	669	1850	2519	72	159490	384.0
B-1	6709	BARRACKS WITH MESS	10101	4675	14776	94	403048	372.0
B-2	7120	BARRACKS	2704	5423	8127	160	467481	322.5
B-3	1582	BACHELOR OFFICER'S QTRS.	1032	1873	2905	48	161460	332.4
B-4	2170	BARRACKS	1347	66	1413	2	5660	266.1
C-1	6990	GYMNASIUM	3953	2540	6493	97	218930	279.5
C-2	3109	THEATER	1137	401	1538	52	34560	337.1
C-3	2607	CHAPEL	513	384	897	12	33130	238.2
C-4	5702	PRATT MUSEUM	1768	907	2675	79	78160	191.1
C-5	6722	POST EXCHANGE	972	1947	2919	67	167840	754.8
C-6	2575	FIRE STATION	918	947	1865	34	81610	246.8
D-1	2440	NCO MESS	625	134	759	3	11570	345.0
E-1	2442	CLASSROOM	514	147	661	6	12670	300.5
E-2	2912	CLASSROOM	441	325	766	11	27990	218.9
F-1	4364	DUPLEX FAMILY HOUSING	0	787	787	33	67870	201.8
F-2	402	DUPLEX FAMILY HOUSING	417	197	614	11	16990	228.8
F-3	4848	MULTI-FAMILY HOUSING	0	4444	4444	145	383130	393.1
F-4	465	SINGLE FAMILY HOUSING	210	266	476	10	22900	300.5
F-5	3027	MULTI-FAMILY HOUSING	795	2061	2856	69	177700	277.4
F-6	7370	MULTI-FAMILY HOUSING	916	2316	3232	144	199680	307.9
L-1	860	LAUNDRY	66960	13227	80187	264	1140240	1443.3
M-1	125	HOSPITAL	3665	2163	5828	112	186460	347.6
MP-1	127	HOSPITAL	5400	1482	6882	18	127820	410.4
M-P	7297	HELICOPTER HANGER	1239	7971	9210	323	687160	189.6
P-1	749	MOTOR REPAIR	238	212	450	9	18250	144.8
RM-1	6256	MOTOR REPAIR SHOP	249	441	690	17	38030	139.1
RM-2	5852	REPAIR & MAINTENANCE	282	34	316	1	2960	136.7

TABLE 2 (CONT'D)
TYPICAL BUILDING ENERGY CONSUMPTION DATA
FORT CAMPBELL

TABLE 3
BUILDING OCCUPANCY
FORT CAMPBELL

GROUP NO.	BLDG.	BUILDING DESCRIPTION	NORMAL PEAK POPULATION	OCCUPANCY
A-1	6914	OFFICE	20	WEEKDAYS - 6:30 A.M. TO 6:00 P.M.; 3 PEOPLE AT NIGHT
A-2	5115	MOTOR REPAIR OFFICE	11	WEEKDAYS - 7:30 A.M. TO 4:00 P.M.
A-3	7258	OFFICE	35	OPEN 24 HOURS - 35 PEOPLE FROM 7:00 A.M. TO 6:00 P.M.; 2 PEOPLE AT NIGHT
B-1	6709	BARRACKS WITH MESS	333	BARRACKS OPEN 24 HOURS MESS OPEN 6:30 A.M. TO 8:00 P.M.; KITCHEN PERSONNEL START AT 8:00 A.M.
B-2	7120	BARRACKS	144	OPEN 24 HOURS
B-3	1582	BACHELOR OFFICERS' QTRS.	24	OPEN 24 HOURS
B-4	2170	BARRACKS	28	OPEN 24 HOURS
C-1	6990	GYMNASIUM	1000	WEEKDAYS - 9:00 A.M. TO 9:00 P.M. WEEKENDS - 12:00 NOON TO 9:00 P.M.
C-2	3109	THEATER	176	WEEKDAYS - 1:00 P.M. TO 10:00 P.M. OCCASIONALLY ON WEEKENDS
C-3	2607	CHAPEL	300	7 DAYS A WEEK, 5 PERSONS AVERAGE, 7:00 A.M. TO 10:00 P.M.; TUESDAY & THURSDAY - 40 PERSONS IN EVENING; SUNDAY - 300 PERSONS, 9:45 A.M. TO 12:00 NOON
C-4	5702	PRATT MUSEUM	25	WEEKDAYS - 12:30 P.M. TO 4:30 P.M. WEEKENDS - 1:00 P.M. TO 4:30 P.M.
C-5	6722	POST EXCHANGE	100	WEEKDAYS - 11:00 A.M. TO 6:00 P.M.
C-6	2575	FIRE STATION	12	OPEN 24 HOURS
D-1	2440	NCO MESS	80	WEEKDAYS - 5:00 A.M. TO 7:00 P.M.
E-1	2442	CLASSROOM	100	WEEKDAYS - 7:00 A.M. TO 6:00 P.M.
E-2	2912	CLASSROOM	125	TUESDAY TO FRIDAY - 8:00 A.M. TO 11:30 A.M.
F-1	4364	DUPLEX FAMILY HOUSING	8	OPEN 24 HOURS
F-2	402	DUPLEX FAMILY HOUSING	8	OPEN 24 HOURS
F-3	4848	FAMILY HOUSING	48	OPEN 24 HOURS
F-4	465	FAMILY HOUSING	4	OPEN 24 HOURS
F-5	3027	FAMILY HOUSING	32	OPEN 24 HOURS
F-6	7370	MULTI-FAMILY HOUSING	32	OPEN 24 HOURS
L-1	860	LAUNDRY	112	WEEKDAYS - 7:00 A.M. TO 3:00 P.M.
M-1	125	HOSPITAL	120	OPEN 24 HOURS
M-2	127	HOSPITAL	120	OPEN 24 HOURS
MP	7297	HELICOPTER HANGER	150	WEEKDAYS - 7:00 A.M. TO 6:00 P.M.
P-1	749	MOTOR REPAIR	10	WEEKDAYS - 7:30 A.M. TO 4:00 P.M.
RM-1	6256	MOTOR REPAIR SHOP	30	WEEKDAYS - 7:30 A.M. TO 4:30 P.M.
RM-2	5852	REPAIR & MAINTENANCE	25	WEEKDAYS - 6:00 A.M. TO 4:30 P.M.
T-1	7851	RECEIVER BUILDING	4	OPEN 24 HOURS
T-2	7238	COMMUNICATION	5	OPEN 24 HOURS - 5 PERSONS FROM 7:00 A.M. TO 4:00 P.M., 2 PERSONS FROM 4:00 P.M. TO 7:00 A.M.
W-1	806	WAREHOUSE	10	WEEKDAYS - 8:00 A.M. TO 3:30 P.M.
W-2	854	WAREHOUSE	N/A	ONLY WHEN SOMETHING IS BEING STORED OR REMOVED
W-3	160	MEDICAL WAREHOUSE	21	WEEKDAYS - 7:30 A.M. TO 4:30 P.M.
L-2	2842	PRESSING PLANT	45	7 DAYS A WEEK - 7:00 A.M. TO 5:00 P.M.
U-1	7635	SEWAGE TREATMENT	2	OPEN 24 HOURS - 7 DAYS A WEEK
U-2	1746	WATER TREATMENT	10	OPEN 24 HOURS - 7 DAYS A WEEK

TABLE 3 (CONT'D)

BUILDING OCCUPANCY

FORT CAMPBELL

TABLE 4
Building Group Source Energy Consumption

<u>Group</u>	<u>Description</u>	<u>Group Sq. Ft.</u>	<u>Total Source Consumption Btu's x 10⁶</u>
A	Administrative	1,137,775	349,534
B	Barracks	3,967,825	1,179,135
C	Community Service	1,135,297	404,776
D	Dining	92,649	31,228
E	Classroom	190,965	51,915
F	Family Housing	5,718,653	1,328,611
L	Laundry	91,078	82,855
MP	Maintenance and Production	464,460	76,588
M	Medical	352,066	128,149
P	Maintenance	219,531	29,816
RM	Maintenance and Repair	716,075	94,704
T	Communications	53,730	33,912
U-1	Sewage Treatment	1,371	5,899
U-2	Water Treatment	10,276	91,068
U-3	Pump Houses	4,663	26,134
U-4	Boiler Plants	18,183	1,689
U-5	Unheated Buildings w/Electricity	18,980	6,018
W	Warehouses	931,999	140,479
Z	Electric Only (includes outdoor lights)	496,999	97,754

ENERGY CONSERVATION PROJECTS
SOURCE ENERGY SAVINGS

BUILDING TYPE	ENERGY SAVINGS BTU x 1,000,000	% BASEWIDE REDUCTION FY 78	PROJECT NO.
FAMILY HOUSING	15,600 12,738 <u>28,338</u>	.41 .34 .75	T-418 288
BARRACKS	65,180	1.72	288
INCINERATOR FACILITY	248,028	6.55	T-416
STEAM PLANTS	24,159	.64	T-420
SELECTIVE ENERGY PLANT	208,000	5.49	
OTHER BUILDINGS AFFECTED BY ECIP'S	1,576 54,800 4,731 <u>61,107</u>	.04 1.45 .12 <u>1.61</u>	T-421 288 T-398
TOTAL	634,812	16.76	

TABLE 5

ENERGY CONSERVATION PROJECTS DEVELOPED SCHEDULE - FT. CAMPBELL, KENTUCKY

PROJECT TITLE	PROJECT NUMBER	RECOMMENDED FISCAL YEAR	COST \$ x 1000	E/C RATIO	ENERGY SAVINGS BTUX 1000,000	YEARS PAYBACK	B/C RATIO
POWER FACTOR IMPROVEMENT (BASEWIDE)	T-398	1981	136	34.87	4,731	13.6	1.26
TOTAL			136		4,731		
SOLID WASTE BURNING INCINERATOR FACILITIES	T-416	1982	7,324	33.9	248,028	12.4	2.09
SUPPLEMENTAL SOLAR DOMESTIC HOT WATER SYSTEMS	T-418	1982	645	24.2	15,600	15.3	1.10
STEAM PLANT MODIFICATIONS	T-420	1982	501	48.3	24,159	6.1	3.3
SOLAR HEATING OF INDOOR SWIMMING POOL AND SHOWER WATER	T-421	1982	80	19.6	1,576	9.9	1.91
ENERGY MONITORING AND CONTROL SYSTEM	288	1982	2,825	46.97	132,718	14.72	1.07
TOTAL			11,670		422,081		
SELECTIVE ENERGY PLANT	1983	72,050	N/A	208,000	17.83	1.33	
TOTAL					208,000		

TABLE 6

APPENDIX B
POTENTIAL CONSERVATION MEASURES

TABLE OF CONTENTS

POTENTIAL CONSERVATION MEASURES REQUIRING CAPITAL INVESTMENT	B-1
POTENTIAL CONSERVATION MEASURES REQUIRING POLICY CHANGES AT INSTALLATION LEVEL	B-3

POTENTIAL CONSERVATION MEASURES REQUIRING CAPITAL INVESTMENT

Project Studied	Comments
1. Install setback/setup controls.	Good project
2. Add warmup cycle with fresh air dampers closed where setback/setup controls are used.	Good project
3. Replace existing coal boilers with gas/oil conversion kits with modern packaged boilers.	This project does not meet the criteria.
4. Replace incandescent lighting with higher efficiency lighting systems.	Good project
5. Replace existing motors with motors of the high efficiency type.	There is an engineering disagreement concerning this project.
6. Insulate existing steam lines.	This project does not meet the criteria.
7. Revise existing chilled water/hot water pumping schemes to more efficient methods.	This project does not meet the criteria.
8. Install economizer systems for "free cooling" in intermediate seasons.	This project does not meet the criteria in retrofit applications.
9. Modify multizone systems to include hot/cold deck reset.	Good project
10. Modify cooling tower systems to cycle fan with load and/or install bypass valving.	Condenser water reset is the best modification.
11. Install load-shedding system to minimize demand charges.	Good project
12. Correct power factor.	Good project
13. Install chilled and hot water reset controls.	Good project

POTENTIAL CONSERVATION MEASURES REQUIRING CAPITAL INVESTMENT
(Continued)

Project Studied	Comments
14. Install FM radio control system.	Good project <input checked="" type="checkbox"/>
15. Upgrade electrical distribution voltage.	This project does not meet the criteria.
16. Install total or selective energy plants.	Selective energy is cost effective.
17. Install energy monitoring and control system.	Good project
18. Install heat reclaim devices on air-cooled condensers.	This is a viable project in mess-halls and family housing.
19. Replace remotely located absorption chillers with more efficient electric-driven chillers.	Good project
20. Install solid waste-burning boilers.	Good project
21. Install trailer enclosing devices at loading docks.	This project has limited application.
22. Install solar energy systems where feasible.	This project has limited application.
23. Install air-to-air heat reclaim devices in high exhaust areas, such as messhall kitchens.	This project does not meet the criteria.

POTENTIAL CONSERVATION MEASURES REQUIRING POLICY CHANGES
AT INSTALLATION LEVEL

<u>Project Studied</u>	<u>Comments</u>
1. Replace domestic water heaters with higher efficiency models as replacement is required.	Good project
2. Shut down steam branch lines in summer.	Good project
3. Reduce domestic hot water temperatures from 140 F to 110-120 F.	Good project.
4. Replace electric motors with motors of the high efficiency type on replacement basis.	Good project
5. Use task lighting.	Good project
6. Install temporary 4-mil plastic storm windows.	Good project
7. Shut down HVAC and DHW systems in unoccupied buildings.	Good project
8. Calk cracks on self-help basis.	Good project
9. Install high-efficiency transformers on replacement basis.	Good project
10. Enforce indoor space temperature regulations.	Good project
11. Repair steam, condensate, chilled water, and HTHW leaks.	Good project
12. Repair air leakage in ducts.	Good project
13. Turn pilot lights for heating equipment off for the summer.	Good project
14. Replace air-conditioning units with high efficiency models as replacement is required.	Good project